

# **HVLS Industrial Fans Evaluation Guide:** 7 Defining Application Design Factors That Will Add Up to a Smart Investment



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## Introduction

When evaluating the need for high volume, low speed (HVLS) industrial fans, every application has its set of challenges. Whether you operate or manage a warehouse, distribution center or a manufacturing facility, or you're an architect, engineer or contractor specifying HVLS fans for new construction, tenant improvement or facility improvement, the interior of every structure has a unique story to tell.

Some interiors need constant cooling for product protection while others in cold climates require increased air circulation for even heat distribution. Other interior spaces stay dry year 'round, while others have floors that notoriously sweat because of high humidity or become wet from outdoor elements getting inside.

Efficiently moving a large volume of air at a low speed is an HVLS industrial fan's very reason for being. Anyone in the vicinity of one can't help but notice its effects. However, many people never consider the "why" behind where a particular fan is located—especially when numerous HVLS fans are involved.

There's more to HVLS industrial fans than many people realize. If your application requires multiple fans (four or more), you owe it to yourself to take the time to work with your fan provider to properly plan their placement. In the end, achieving your desired outcomes ensures that you'll gain the maximum benefit out of your HVLS industrial fans investment.

*This white paper addresses seven defining application design factors for HVLS industrial fans:*

**1. Establish your goals early to ensure the right results later.**

*Determine what you realistically expect to achieve with HVLS industrial fans.*

**2. General rules do exist (but there are plenty of exceptions).**

*Always remember that every site application is different.*

**3. Hot vs. cold: critical considerations between summer cooling and winter destratification.**

*Plan accordingly based on your local climate and your facility's layout.*

**4. Don't slip up on wet floors, summer comfort or product protection.**

*Properly plan for moisture issues as well as the hottest months.*

**5. More questions are always better than not enough questions.**

*A thorough site analysis is one of the keys to success.*

**6. Typical industrial spacing is not always so "typical."**

*Fact: every facility has very different needs.*

**7. Juggling multiple facility issues to achieve multiple solutions.**

*Why a one-size-fits-all approach is never your best option!*

## The Defining Factors

### Factor #1:

**Establish your goals early to ensure the right results later.**

*Determine what you realistically expect to achieve with HVLS industrial fans.*

At this stage in your planning, you've undoubtedly determined that your facility needs HVLS industrial fans. Aside from the basic considerations based on the size of your facility—such as how many fans will you need, how large in diameter the fans should be and where they should be located—now's a good time to ask what are we expecting to achieve with our fans? What are our goals that we need to meet once the fans are installed and operating?

Asking those questions after your HVLS industrial fans are installed and operating is clearly not the right time to address such issues. It can be very costly to reconfigure a multiple HVLS industrial fan layout after the fact. Once your fans are running, the last thing you need is regret, wishing you had taken the time to study your goals after finding out that the fans are not providing the results you had anticipated.

**Warning: it can be very costly to reconfigure a multiple HVLS industrial fan layout after the fact.**

For example, problems with floor sweating or moisture build up require a consistent velocity of air movement at floor level which is different than environments that don't require the same amount of air movement at the floor surface. If you're more interested in cooling and comfort as your highest priority, that same velocity at ground level isn't as important. For cooling people, the air simply needs to reach the people being cooled.

For manufacturing, you need to address how specific areas are covered with the right type of air movement. There are always obstructions involved, so they need to be taken into account as well to ensure that air is moving properly.

Another concern is whether or not your existing HVAC system is doing its job. If not, strategically placed HVLS industrial fans will compensate for the added airflow to circulate cooler air or warmer air, depending on your specific needs. If the fans are not properly located, they won't produce the necessary outcome for your particular application.

**Factor #2:**

**General rules do exist (but there are plenty of exceptions).**

*Always remember that every site application is different.*

HVLS industrial fan application planning requires more than just basing decisions on standard measurements and square footage. While general rules do exist, there are important variables that need to be taken into account.

One often overlooked variable is obstructions. Airflow from HVLS industrial fans can be obstructed due to:

- solid walls
- racking
- stacked pallets
- solid stacks of product inventory
- machinery
- lighting
- electrical conduits and water pipes
- HVAC ductwork

There may even be additional obstacles that impede airflow such as bridge or gantry cranes, conveyors, signage that hangs from the ceiling and even safety nets. These types of obstructions all have an impact on fan size and the quantity of fans required.

Since obstructions are so disruptive to airflow, careful planning will ensure that your facility's fans are properly spaced and, more importantly, that you don't install any unnecessary fans.

For instance, a site analysis will help to determine if your fans will require closer spacing for added velocity or whether they'll need spaced farther apart so that airflow won't be disrupted in certain areas. Since some environments don't require the same amount of air velocity, fans can be spaced farther apart. This will, in turn, save costs on the total number of fans required.

HVLS industrial fan application planning becomes even more challenging with new construction projects. Because construction plans only offer so much detail, unexpected obstructions may not become apparent until they show up within a structure that is nearing completion.

**Obstructions have an impact on fan size and the quantity of fans that your facility needs.**

For example, a fan that is too closely aligned with a large roll up door can pose a safety issue if subjected to a powerful wind gust when the door is open. That's when an all-important site visit can help fine tune fan installation locations before the actual work begins.

**Factor #3:****Hot vs. cold: critical considerations between summer cooling and winter destratification.**

*Plan accordingly based on your local climate and your facility's layout.*

Correct HVLS industrial fan placement can have a tremendous impact on the level of cooling comfort for your employees during the summer when your facility's HVAC system is working hard to keep temperatures cool inside while outside temperatures soar.

And during cold winter months, the heated air in your facility will rise to the upper most levels while the cool air sinks. That means the air in your facility has become stratified. It also means that the cost you're incurring to heat your facility is being wasted. Instead of keeping your employees warm at the floor level, the air is trapped against the ceiling.

HVLS industrial fans will also work hard during the cold winter months to efficiently "destratify"—or thermally equalize—the heated air with the cooler air layer beneath to provide the most optimal working temperature for employees in your facility.

Regardless of whether your goals are to improve interior cooling or heating, an often overlooked planning aspect is where obstacles are located within your floor plan. When HVLS fans push air to ground level, they create a "floor jet" that moves outward to achieve its desired effect on the people in its path.

However, when the floor jet hits an obstruction, the obstruction will immediately slow the floor jet's velocity. Instead of providing the intended cooling effect, the air movement will move around or up and over the people behind the obstruction. The amount of air they then feel will be much different than if they were in the floor jet's direct path.

**HVLS industrial fans work hard during winter months to efficiently "destratify"—or thermally equalize—the layers of warmer and cooler air in a facility.**

With destratification, that same undesired effect can occur with obstacles that might interfere with warm air that the fans are circulating downward. While a properly positioned fan might be effectively warming the area below it, an improperly positioned fan may have its airflow blocked. That, in turn, will cause a cooler pocket of space where warmer air isn't sufficiently reaching the floor area.

**Factor #4:****Don't slip up on wet floors, summer comfort or product protection.**

*Properly plan for moisture issues as well as the hottest months.*

Three important HVLS industrial fan benefits include improving workplace safety by drying out wet floors, keeping employees cool during hot weather, and protecting valuable perishables.

At warehouse docks, for example, HVLS industrial fans not only provide workers added comfort when interior and/or outdoor temperatures climb above 85 degrees, they also help dry out any wet floors that occur from outside elements that might make it through dock door openings when they're not properly sealed.

Improper humidity control can also contribute to wet floors. HVAC systems that are not functioning properly can actually contribute to excess moisture buildup on a ceiling that actually causes the moisture to condense on and drip from the ceiling.

HVLS industrial fans can help prevent that condensation in the first place when properly sized and placed to produce the right amount of air circulation. For situations where wet floors are unavoidable, HVLS industrial fans will help keep floors dry with the proper air velocity at ground level.

**The key is to place HVLS industrial fans in the locations where they are going to provide the maximum amount of benefit.**

Regulating interior space temperatures means going beyond providing added comfort. Proper air circulation also helps keep sensitive products like food, produce, cosmetics and pharmaceuticals dry and fresh and reduces spoilage potential, making HVLS industrial fans especially useful in climate-controlled facilities.

However, warehouse loading docks that aren't climate-controlled are a potential problem hot spot for perishable products that have been unloaded from refrigerated trailers. Once those products are sitting on a dock that's 60 degrees warmer than the inside of the trailer for an extended period of time, problems will develop. Properly located HVLS industrial fans will keep the air circulating sufficiently around the products until they're moved to their intended location.

Bottom line, whether your concerns are employee comfort and safety, product protection or any combination of all three, the key is to place HVLS industrial fans in the locations where they are going to provide the maximum amount of benefit.

**Factor #5:****More questions are always better than not enough questions.***A thorough site analysis is one of the keys to success.*

The best way to measure the progress of your HVLS industrial fan planning process is to evaluate how genuinely interested your fan provider is about your specific application.

Are they just quickly assessing your needs to come up with a specific quantity of fans for you to purchase? Or, are they taking the time to clearly understand your goals, and then making a substantive and sound recommendation based on a thorough analysis of your environment?

Fluid dynamics computer simulation programs will only go so far to identify the solutions you require because they don't take into account what actually is unique to your environment. That takes a thorough understanding of your unique space. In addition, environments often change, depending on your business, efficiency needs, innovation and the economy.

**Fluid dynamics computer simulation programs will only go so far to identify the solutions you require for your specific environment.**

For example, a space that's currently used for product staging or storage with little need for human interaction may in six months be used as a work cell for a specific employee-intensive manufacturing process. So, a space where there is little concern for cooling comfort can easily become one where cooling comfort is a primary concern.

Advance planning in such cases is then critical for the proper design of your HVLS industrial fan installations.

Other questions to anticipate from your HVLS industrial fan provider might include:

- What are the primary goals that you want to achieve with your HVLS industrial fans?
- Do you need fans to cover your entire interior space, or just a portion of your facility?
- What obstacles might hinder the path of your fans' airflow now, but more importantly, in the future?
- What specific interior climate concerns do you want your fans to address?
- If you ultimately want to cover your entire interior space with fans, do you have any budget concerns that would prevent you from doing so now?\*

\*Important because this affects fan layout, design, and airflow, but ensures the fan layout will accommodate additional fans in the future without disrupting the initial design.



**Factor #6:****Typical industrial spacing is not always so “typical.”**

*Fact: every facility has very different needs.*

Whether your facility needs to replace improperly spaced HVLS fans from another provider that are not meeting your requirements, or if you’ve reached the point where you can no longer operate your facility sufficiently without the benefits HVLS industrial fans offer, a fan provider that has an engineering mindset offers a big advantage.

Looking at your needs from an engineering perspective will help you understand why what’s referred to as “typical industrial spacing” will not work for all fan applications. All structures have different designs, building methods, as well as floor and ceiling obstructions that contribute to changing airflow patterns and essentially dictate where fans can be located. These various constraints and considerations also impact what size fan your facility will accommodate.

Adding HVLS industrial fans to your facility is much more than just pointing to specific locations and deciding that the fans will “look really good over there.” Or, using the rationale that you need to base your decision on the total amount of square feet in your facility to determine the exact number of HVLS fans you need.

**Adding HVLS industrial fans to your facility involves much more than just deciding that they’ll “look really good over there.”**

Approaching your HVLS industrial fan installation from an engineering perspective is a much better approach and includes several vital steps:

- Taking the time to thoroughly know and understand your facility from the ground up, including how you’re currently using your existing space and what plans, if any, you have to change the use of that space as your business adapts and grows;
- Recommending the right size of fan that’s designed for your specific environment;
- Providing a comprehensive site layout plan to optimize each fan location for optimal air movement, and;
- Ensuring that you have the right type of fan control that fits your needs (whether via a standard remote, multi-fan remotes, network control systems or integrating it into your facility’s building management system).

**Factor #7:****Juggling multiple facility issues to achieve multiple solutions.**

*Why a one-size-fits-all approach is never your best option!*

While every facility has unique airflow challenges, structures of all shapes and sizes often face a variety of simultaneous air movement issues that require different solutions.

One area of your facility might have stagnant air while another area has ongoing problems with wet floors. On top of that, you might have an area that your HVAC is trying to keep cool during the hottest months of the year, but it's not keeping up.

The best way to handle these types of challenges is to address them independently. They may require different approaches to the layout process, such as placing fans in locations that allow the fans to work in conjunction with HVAC registers and discharge units, integrating the details of a racking plan to figure out how the fans should be properly positioned to drive airflow and eliminate stagnant air pockets, or placing fans to maximize airflow and eliminate moisture build up on floors.

Consider a large warehouse with exterior walls that are 700 feet apart. While the warehouse's outer third perimeter—where most employees might be working—is experiencing adequate cooling with its existing HVAC, the air in the warehouse's internal core remains hot and stagnant.

**Simply installing a preset number of fans with the same diameter and spacing throughout the warehouse would not have produced the correct result.**

Since employees are not regularly using that space, providing added cooling comfort is not as much of a concern there as it is in the outer perimeter area. However, effectively removing the stagnant, hot air from the warehouse's core does remain a problem.

With proper planning, the undesirable air at the center of the warehouse can be effectively moved outward to mix with the cooler air at the perimeter areas. Additional HVLS industrial fans on the perimeter would then provide the added cooling comfort effect for personnel.

In this case, the fans at the center of the warehouse might be a different diameter and spaced apart differently than those fans located around the warehouse perimeter so that they all work as a system. As a result, simply installing a preset number of fans with the same diameter and the same spacing throughout the warehouse would not have produced the correct result.

## Conclusions

This white paper has clearly defined seven of the most important application and design factors that you need to consider before making your final decision about your HVLS industrial fans investment.

Take the time to consider the points covered here that will help guide you through the decision-making process. Also, you might want to share these considerations with the key stakeholders in your organization who might be helping you make your decision about HVLS industrial fans.

### It's important that you have a firm grasp of the following:

- *Why you need to outline your HVLS fan goals early and realistically to ensure you'll experience the right results later;*
- *Every site application is different, and that even though general rules do exist for fan placement, there are plenty of exceptions to be aware of;*
- *Summer cooling and winter destratification require different approaches to planning depending on your local climate and your facility's layout;*
- *Wet conditions, making sure employees are cool and comfortable, and protecting perishable products are issues that are too important to take lightly;*
- *Make sure you're HVLS fan provider is asking more questions instead of less so they gain a firm understanding of your requirements;*
- *Because every facility has different needs, typical industrial spacing for HVLS industrial fans is not always the right approach;*
- *Multiple facility issues often require multiple solutions which means "one-size-fits-all" is not the right answer.*

If you don't, you run the risk of making an unsound decision—or worse yet—a series of potentially expensive mistakes about your HVLS industrial fan investment. Making the wrong choice could end up costing your company or business thousands of dollars to correct if your HVLS industrial fans don't end up providing the results you expected throughout your facility.

To learn more about HVLS industrial fans, as well as which approaches and solutions are best suited for your warehouse, distribution center or manufacturing operation, go to [4Frontes.com](http://4Frontes.com)

## About HVLS Fans

HVLS Fans is a dedicated channel under 4Front Engineered Solutions that features both the HVLS industrial fan, which is ideal for environments such as warehouses, distribution centers, and manufacturing operations, as well as the commercial HVLS fan for commercial applications. Aerodynamic designs, sophisticated touchscreen controls, and networking solutions make our fans best in class. Learn more about our fans at [4Frontes.com](https://www.4frontes.com).

4Front Engineered Solutions is a leader in engineering products that help businesses across a wide variety of industries perform more efficiently and profitably. Our HVLS fans have been beautifully designed and expertly engineered to improve energy efficiency in commercial and industrial spaces, and our sophisticated iFAN<sup>®</sup> and networking solutions provide even greater control.





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